a) $\log(s_i^2) + \frac{2p_i}{n}$ $i=0,1$

$$\log(s_0^2) + \frac{2p_0}{n} < \log(s_1^2) + \frac{2p_1}{n}$$

$$\log(s_0^2) - \log(s_1^2) < \frac{2}{n}(p_1 - p_0)$$ $\log(a) - \log(b) = \log\left(\frac{a}{b}\right)$

$$\log\left(\frac{s_0^2}{s_1^2}\right) < \frac{2(p_1 - p_0)}{n}$$ exponent both sides

$$\left(\frac{s_0^2}{s_1^2}\right) < e^{\frac{2}{n}(p_1 - p_0)}$$

b) $e^x \approx 1 + x$ $\quad e^{\frac{2}{n}(p_1 - p_0)} \approx 1 + \frac{2}{n}(p_1 - p_0)$

$$\frac{s_0^2}{s_1^2} < 1 + \frac{2}{n}(p_1 - p_0)$$

$$\frac{s_0^2}{s_1^2} - 1 < \frac{2}{n}(p_1 - p_0)$$

$$\frac{s_0^2 - s_1^2}{s_1^2} < \frac{2}{n}(p_1 - p_0) \quad (*)$$

c) $s^2 = e'e/(n-k)$ $\quad s_0^2 = e_R'e_R/(n-p_0)$ $\quad s_1^2 = e_u'e_u/(n-p_1)$

n large

$(*)$ LHS $\quad \frac{s_0^2 - s_1^2}{s_1^2} = \frac{e_R'e_R/(n-p_0) - e_u'e_u/(n-p_1)}{e_u'e_u/(n-p_1)}$ $\quad n - p_0 \approx n$, $\; n - p_1 \approx n$

$(*)$ becomes $\quad \frac{e_R'e_R - e_u'e_u}{e_u'e_u} < \frac{2}{n}(p_1 - p_0)$

d) $\quad F = \dfrac{(e_R'e_R - e_u'e_u)/(p_1 - p_0)}{e_u'e_u/(n-p_1)}$

from c) $\quad \dfrac{e_R'e_R - e_u'e_u}{e_u'e_u} < \dfrac{2}{n}(p_1 - p_0) \quad (**)$ $\quad \times \dfrac{n-p_1}{p_1-p_0}$

F nearly equal to LHS of $(**)$

$$\frac{(e_R'e_R - e_u'e_u)/(p_1 - p_0)}{e_u'e_u/(n-p_1)} < 2\,\frac{n-p_1}{n}$$

$\to$ n large $\dfrac{2(n-p_1)}{n} \simeq 2$